

Listing of Claims:

Claim 1 (original). A hybrid power supply apparatus interchangeable with a conventional battery removably positionable within a battery receptacle tray of an electric vehicle, the battery having a power output connectable to the drive system of the vehicle, said hybrid power apparatus comprising:

- (a) a fuel cell;
- (b) an energy storage device chargeable by said fuel cell;
- (c) a housing enclosing said fuel cell and said energy storage device, wherein said housing is sized to fit within said battery receptacle tray; and
- (d) a power output electrically connectable to said storage device and extending externally of said housing for electrically coupling said apparatus to said drive system of said vehicle when said housing is positioned within said battery receptacle tray.

Claim 2 (original). The apparatus of claim 1, further comprising a coolant system for flowing gas through said housing, said coolant system comprising:

- (a) a gas inlet for drawing gas into said housing;
- (b) at least one blower positioned within said housing for moving gas through said housing in predetermined flow paths to regulate the temperature of said apparatus; and
- (c) a gas outlet for expelling exhaust gas from said housing.

Claim 3 (original). The apparatus of claim 2, wherein said housing comprises a user interface surface which is exposed when said housing is placed within said vehicle receptacle tray, wherein said gas inlet and gas outlet are located on said user interface surface.

Claim 4 (original). The apparatus of claim 3, wherein the temperature of said exhaust gas does not exceed 50 °C when said coolant system is in operation.

Claim 5 (original). The apparatus of claim 3, wherein said coolant system maintains said user interface surface at a temperature not exceeding 50 °C when said apparatus is in operation.

Claim 6 (original). The apparatus of claim 2, wherein said energy storage device is located within said housing proximate said gas inlet.

Claim 7 (original). The apparatus of claim 1, further comprising a fuel processor positioned within said housing for converting a source of fuel to hydrogen-enriched gas for delivery to said fuel cell.

Claim 8 (original). The apparatus of claim 7, further comprising a fuel storage chamber located within said housing, wherein said storage chamber is in fluid communication with said fuel processor.

Claim 9 (original). The apparatus of claim 8, further comprising a fuel inlet on said housing in fluid communication with said fuel storage chamber.

Claim 10 (original). The apparatus of claim 9, wherein said housing comprises a user interface surface which is exposed when said housing is placed within said vehicle receptacle tray, wherein said fuel inlet is located on said user interface surface.

Claim 11 (original). The apparatus of claim 8, wherein said fuel chamber is thermally isolated from the remainder of said housing.

Claim 12 (original). The apparatus of claim 1, further comprising a fuel storage chamber located within said housing, wherein said storage chamber is in fluid communication with said fuel cell.

Claim 13 (original). The apparatus of claim 8, wherein said fuel storage chamber stores menthanol fuel.

Claim 14 (original). The apparatus of claim 8, wherein said fuel storage chamber stores propane fuel.

Claim 15 (original). The apparatus of claim 1, further comprising a controller positioned within said housing for regulating operation of said fuel cell depending upon the state of charge of said energy storage device.

Claim 16 (original). The apparatus of claim 1, wherein said energy storage device comprises at least one battery.

Claim 17 (original). The apparatus of claim 1, wherein said energy storage device comprises at least one capacitor.

Claim 18 (original). The apparatus of claim 1, further comprising a DC/DC power converter positioned within said housing for converting DC current generated by said fuel cell to a voltage suitable for charging said energy storage device.

Claim 19 (original). The apparatus of claim 1, further comprising a load compensator positioned within said housing for increasing the weight of said apparatus to a weight approximating the weight of said conventional battery.

Claim 20 (original). The apparatus of claim 1, further comprising a first vibration dampener positioned within said housing for absorbing vibration when said vehicle is in operation.

Claim 21 (original). The apparatus of claim 20, comprising a second vibration dampener which surrounds at least part of said housing when said housing is positioned within said battery receptacle tray.

Claim 22 (original). The apparatus of claim 1, wherein said housing is sized to fit within a pallet truck battery receptacle tray having the following dimensions: 31" L X 13" W X 32" H.

Claim 23 (original). The apparatus of claim 1, wherein said housing is sized to fit within a narrow aisle lift truck battery receptacle tray having the following dimensions: 38" L X 20" W X 31" H.

Claim 24 (original). The apparatus of claim 1, wherein said housing is sized to fit within a sit-down lift truck battery receptacle tray having the following dimensions: 38" L X 32" W X 22" H.

Claim 25 (original). A method of converting an electric vehicle having a high peak power to average power ratio to hybrid power, the vehicle having a conventional battery removably positionable within a battery receptacle tray of the vehicle and electrically connectable to a drive system of the vehicle, said method comprising;

- (a) providing a hybrid power supply apparatus as defined in claim 1;
- (b) removing said conventional battery from said battery receptacle tray;
- (c) positioning said housing of said hybrid power apparatus within said battery receptacle tray; and
- (d) electrically connecting said power output of said hybrid power apparatus to said drive system of said vehicle.

Claim 26 (original). A stand-alone hybrid power supply apparatus comprising:

- (a) a fuel cell;
- (b) an energy storage device chargeable by said fuel cell;
- (c) a housing enclosing said fuel cell and said energy storage device within a self-contained space; and
- (d) a power output on an external surface of said housing for electrically connecting said apparatus to a load, wherein said output is the sole interface between said apparatus and said load.

Claim 27 (original). The apparatus of claim 26, wherein said housing has a size not exceeding 38" L X 32" W X 31" H.

Claim 28 (original). A hybrid power apparatus for use in a battery-operated vehicle provided with an electrical receptacle and a battery receptacle tray, the hybrid power apparatus comprising;

(a) a hybrid fuel cell subsystem including a fuel reformer, fuel cell, DC power converter, microcontroller and energy storage device;

(b) a housing containing said hybrid fuel cell subsystem and having dimensions less than said battery receptacle tray such that said housing is movable within said tray;

(c) an external DC interface attached to said housing and electrically connected to said hybrid fuel cell subsystem and including a plug interface suitable to mate to said vehicle electrical receptacle; and

(d) gas inlet and outlet interfaces mounted on at least one uncovered surface of said housing when said housing is placed within said tray, wherein said interfaces are connected to said hybrid fuel cell subsystem and include circulation fans and valves connected to and controlled by said microcontroller of said hybrid fuel cell subsystem.

Claim 29 (new). A removable power source for use in a host machine that operates on electrical power, the host machine having a peak power demand, comprising:

a housing;

a battery disposed within said housing, said battery sized to supply the peak power demand of the host machine;

an electrical power generator disposed within said housing and sized to supply less than the peak power demand of the host machine; and

a power control module disposed within said housing and coupled to said battery and said electrical power generator and arranged to supply power to the host machine from either said battery or said generator.

Claim 30 (new). The power source of claim 29, wherein said electrical power generator further comprises:

an internal combustion engine; and

an electrical generator coupled to said internal combustion engine.

Claim 31 (new). The power source of claim 29, wherein said electrical power generator further comprises a fuel cell.

Claim 32 (new). The power source of claim 29, wherein said housing is sized to fit in a compartment for holding a battery of said machine.

Claim 33 (new). The power source of claim 32, wherein said housing is removable from the compartment for holding a battery.

Claim 34 (new). The power source of claim 30, wherein said internal combustion engine is a spark ignition engine.

Claim 35 (new). The power source of claim 30, wherein said internal combustion engine is a compression ignition engine.

Claim 36 (new). The power source of claim 30, wherein said internal combustion engine is a rotary engine.

Claim 37 (new). The power source of claim 30, wherein said internal combustion engine is a reciprocating engine.

Claim 38 (new). A method of replacing a battery in an electric powered machine with a rapidly renewable power source, comprising:

uncoupling the battery from the machine;

removing the battery from the battery compartment of the machine;

placing a rapidly renewable power source in the battery compartment; and

coupling the rapidly renewable power source to the machine.

Claim 39 (new). A method for converting a battery-powered machine to a hybrid powered machine comprising the steps:

uncoupling the battery from the machine;

removing the battery from the machine;

placing a hybrid power source in the battery compartment of the machine; and

coupling the hybrid power source to the machine.

Claim 40 (new). An electric vehicle having a peak power requirement, comprising:

a power source electrically coupled to the electric vehicle, said power source comprising:

a housing,

a battery disposed within said housing, said battery sized to supply the peak power requirement of the host machine,

a power control module disposed within said housing and coupled to said battery, and

an electrical power generator disposed within said housing and coupled to said power control module, said electrical power generator sized to supply less than the peak power requirement of the electric vehicle.

Claim 41 (new). The electric vehicle of claim 40 wherein said electric vehicle is a forklift further comprising

a lifting mechanism coupled to said electric vehicle.

Claim 42 (new). The vehicle disclosed in claim 40 wherein said vehicle is a work platform further comprising a scissor type lifting mechanism coupled to said chassis.

Claim 43 (new). The electric vehicle of claim 40, wherein said housing is removable as a unit.

Claim 44 (new). The power source of claim 29, wherein said electrical power generator further comprises:

an external combustion engine; and

an electrical generator coupled to said external combustion engine.

Claim 45 (new). The power source of claim 44, wherein said external combustion engine is a gas turbine.

Date: 14 OCTOBER 2003

Respectfully submitted,


J. Grant Foster

Registration No. 33,236